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FEBRUARY 24, 1986

CHEMICAL & ENGINEERING

NEWS

FINAL PROGRAM
ACS meeting in New York City
Page 39

Chemical Earnings

Fifth straight quarterly decline
Page 10

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CHEMICAL & ENGINEERING NEWS

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FEBRUARY 24, 1986

News of the Week

■ **NSF grant holders face cuts of up to 10% in fiscal 1986 under Gramm-Rudman-Hollings Act.** **Page 4**

■ **So-called "spy dust" found in U.S. embassies in the U.S.S.R. is not a health hazard, tests show.** **Page 5**

■ **Oberlin College marks centennial of discovery of electrolytic process for producing aluminum.** **Page 5**

■ **Du Pont to require job applicants, some employees to undergo testing for illegal drug use.** **Page 5**

■ **Iraq apparently is using chemical weapons in Iranian war.** **Page 6**

■ **Fertilizer demand in North America in 1986 will be flat or down slightly from 1985 levels, marketers forecast.** **Page 6**

Cover: Photo courtesy of Interox America

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Business

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International Business

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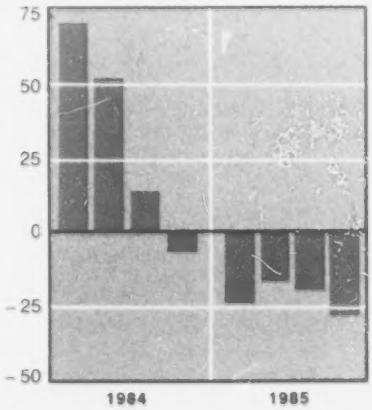
Glass-cracking study at Sandia National Laboratories may lead to more-reliable glass/ceramic products. **Page 34**

Earnings

% change from year-earlier quarter



Cover Story

Fourth-quarter earnings continue downward trend for the U.S. chemical industry, sending full-year profits down from 1984 levels. **Page 10**

Chemical Earnings Continued Downward Trend in Fourth Quarter

William J. Storck, C&EN New York

Earnings for the U.S. chemical industry fell once again in the fourth quarter, sending full-year profits down from 1984 levels. The weakness in earnings also affected the oil and gas producers with chemical operations and diversified companies that include chemicals in their portfolios.

However, the fourth quarter was a period of transition and positioning for the U.S. chemical industry. Many companies, as is customary, used the fourth quarter to write down marginal operations, to dispose of businesses, and to cut employment in an effort to increase productivity.

It also may prove to have been a period of transition in another way. Although earnings for some companies were down from the same period the year before, and in some cases showed losses, many other companies had large increases in earnings. Some industry observers say that this is the pattern before a turnaround in chemicals—that there will be wide diversity of results among producers. If this proves to be true, it certainly bodes well for the first part of this year.

Companies themselves were preparing for 1986. Firms such as Monsanto, Reichhold Chemicals, American Cyanamid, Union Carbide, and others took large nonrecurring charges from the sale of operations, early retirement incentive and layoff programs, and shuttering of operations. That trend was so pervasive and the result was so large that if the nonrecurring items were not ex-

Chemical industry leaders for the fourth quarter. . .

Sales

Rank 1985	$ Millions	Rank 1984
1 Dow Chemical	$2909.0	1
2 Union Carbide	2320.0	2
3 W. R. Grace	2013.2	3
4 Monsanto	1760.0	4
5 PPG Industries	1100.0	5
6 American Cyanamid	890.0	6
7 Celanese	760.0	7
8 National Distillers	649.1	9
9 Hercules	636.2	8
10 Morton Thiokol	480.4	11

Earnings*

	$ Millions	Rank 1984
PPG Industries	$59.0	1
Celanese	50.0	8
W. R. Grace	44.7	2
American Cyanamid	38.7	3
Ethyl	37.9	6
Union Carbide	37.5	16
Air Products	34.4	9
Morton Thiokol	32.0	10
Hercules	31.0	4
Rohm & Haas	24.7	11

Profitability

	Earnings as % of sales	Rank 1984
International Flavors	12.0%	1
Freeport-McMoRan	10.5	2
Nalco Chemical	10.0	3
Ethyl	10.0	4
Loctite	8.5	5
Air Products	7.2	8
Morton Thiokol	6.7	11
Celanese	6.6	17
PPG Industries	5.4	12
Rohm & Haas	5.2	13

. . . and for full-year 1985

Sales

Rank 1985	$ Millions	Rank 1984
1 Dow Chemical	$11,537.0	1
2 Union Carbide	9,000.0	2
3 W. R. Grace	7,260.1	3
4 Monsanto	6,750.0	4
5 PPG Industries	4,300.0	5
6 American Cyanamid	3,536.1	6
7 Celanese	3,046.0	7
8 Hercules	2,587.0	8
9 National Distillers	2,289.0	9
10 Rohm & Haas	2,051.2	10

Earnings*

	$ Millions	Rank 1984
PPG Industries	$303.0	3
Union Carbide	251.3	2
Monsanto	213.0	1
Celanese	182.0	8
Air Products	145.8	9
American Cyanamid	142.9	4
Hercules	142.1	6
Rohm & Haas	141.2	7
Ethyl	137.1	10
Morton Thiokol	126.5	11

Profitability

	Earnings as % of sales	Rank 1984
International Flavors	13.9%	1
Freeport-McMoRan	11.1	3
Nalco Chemical	10.7	2
Loctite	9.3	4
Ethyl	8.9	9
Air Products	7.8	7
Petrolite	7.2	5
PPG Industries	7.0	11
Rohm & Haas	6.9	6
Morton Thiokol	6.7	14

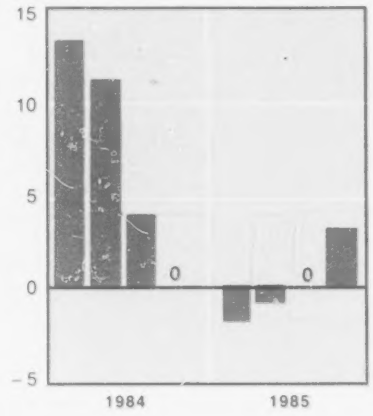
a After taxes. **Note:** Based on 30 companies listed on page 12.

Chemical industry 1985 fourth-quarter results

- Sales were up slightly
- Earnings faltered
- Profit margins fell to 3.1%
- Production rose 2.6%
- Prices were level

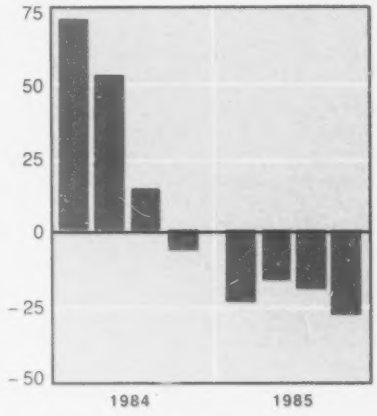
Sales

% change from year-earlier quarter



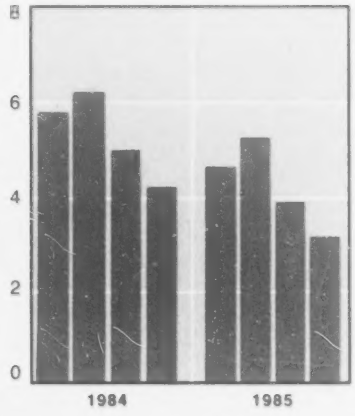
Earnings

% change from year-earlier quarter



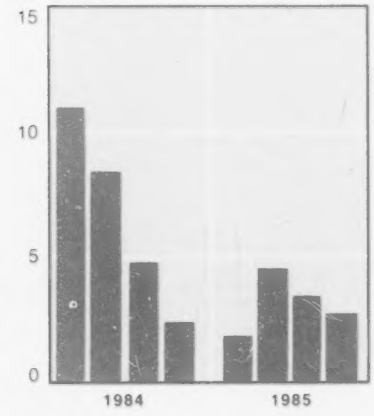
Profit margins

After-tax earnings as % of sales



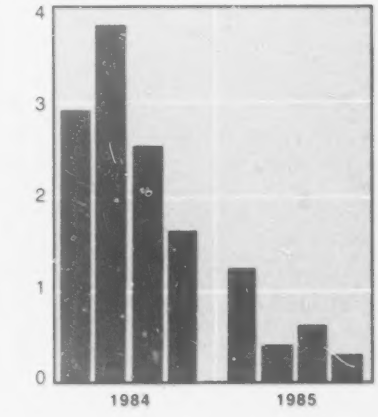
Production

% change from year-earlier quarter



Prices

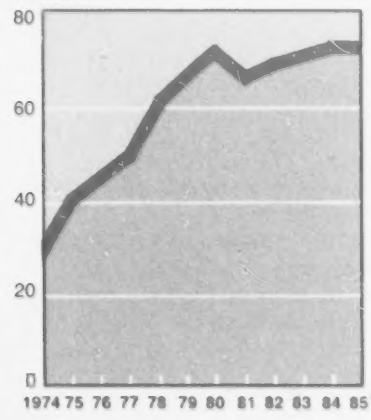
% change from year-earlier quarter



Sales for 1985 were flat, but profits fell 16%, dropping profit margins to lowest level since 1981

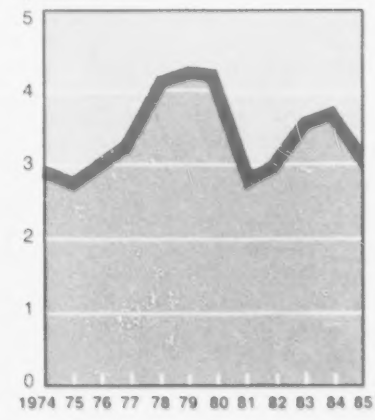
Annual sales

$ Billions



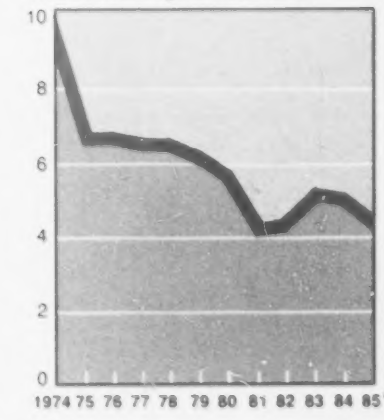
Annual earnings

$ Billions



Annual profit margins

After-tax earnings as % of sales



a C&EN estimates. **Note:** All sales, earnings, and profit-margin data are based on combined results of the 30 companies listed on page 12

Earnings, profit margins continued to fall in fourth quarter

	FOURTH-QUARTER 1985						FULL-YEAR 1985					
	Sales	Earnings[a]	Change from 1984		Profit margin[b]		Sales	Earnings[a]	Change from 1984		Profit margin[b]	
	($ millions)		Sales	Earnings	1985	1984	($ millions)		Sales	Earnings[a]	1985	1984
Air Products[c]	$ 475.9	$ 34.4	9%	7%	7.2%	7.4%	$ 1,869.9	$ 145.8	7%	5%	7.8%	7.9%
American Cyanamid[c]	890.0	38.7	0	−17	4.3	5.2	3,536.1	142.9	0	−28	4.0	5.6
Celanese[c]	760.0	50.0	−8	52	6.6	4.0	3,046.0	182.0	−8	12	6.0	4.9
Chemed	94.2	4.4	5	26	4.6	3.8	372.7	17.9	8	−2	4.8	5.3
Chesebrough-Pond's	na	na	na	na	na	7.5	na	na	na	na	na	6.4
Crompton & Knowles	57.2	2.3	8	17	4.1	3.8	231.2	7.6	0	−4	3.3	3.4
Dow Chemical[c,d]	2,909.0	−314.0	8	def	def	2.6	11,537.0	58.0	1	−86	0.5	3.6
Essex Chemical	na	na	na	na	na	7.4	na	na	na	na	na	4.0
Ethyl	379.4	37.9	−2	−1	10.0	9.9	1,547.0	137.1	−8	8	8.9	7.6
First Mississippi	73.8	3.1	15	−35	4.2	7.3	282.2	12.6	−2	−42	4.4	7.5
Freeport-McMoRan	155.1	16.3	−28	−35	10.5	11.5	722.2	80.4	−14	−12	11.1	10.9
H. B. Fuller	116.7	4.2	5	26	3.6	3.0	457.9	13.3	2	2	2.9	2.9
W. R. Grace[c]	2,013.2	44.7	8	−21	2.2	3.0	7,260.1	106.0	6	−46	1.5	2.9
Hercules[c]	636.2	31.0	3	−30	4.9	7.1	2,587.0	142.1	1	−28	5.5	7.7
International Flavors	122.3	14.6	18	18	12.0	12.0	501.0	69.7	5	1	13.9	14.5
International Minerals	341.2	3.3	−10	−90	1.0	9.1	1,535.2	55.2	−4	−47	3.6	6.4
Loctite	65.2	5.6	12	1	8.5	9.4	239.9	22.4	−2	−13	9.3	10.6
Lubrizol	na	na	na	na	na	6.8	na	na	na	na	na	8.1
Monsanto[c]	1,760.0	−59.0	13	def	def	2.6	6,750.0	213.0	1	−51	3.2	6.6
Morton Thiokol[c]	480.4	32.0	8	10	6.7	6.5	1,888.5	126.5	2	11	6.7	6.2
Nalco Chemical	184.8	18.5	11	8	10.0	10.3	682.3	73.3	3	0	10.7	11.0
National Distillers[c]	649.1	17.9	11	16	2.8	2.6	2,289.0	60.3	2	−21	2.6	3.4
Olin[c]	390.6	8.4	−10	6	2.1	1.8	1,751.1	39.7	−3	−46	2.3	4.1
Pennwalt	258.4	6.2	6	−46	2.4	4.7	1,013.3	11.2	3	−75	1.1	4.6
Petrolite	80.2	3.6	7	−49	4.5	9.4	309.0	22.4	5	−13	7.2	8.8
PPG Industries[c]	1,100.0	59.0	0	−11	5.4	6.0	4,300.0	303.0	2	0	7.0	7.2
Reichhold Chemicals	193.6	−10.9	9	def	def	3.3	822.5	0.4	3	−98	0.1	3.2
Rohm & Haas[c]	470.7	24.7	4	−2	5.2	5.5	2,051.2	141.2	0	−18	6.9	8.4
Union Carbide[c]	2,320.0	37.5	−3	188	1.6	0.5	9,000.0	251.3	−5	−26	2.8	3.6
Witco Chemical	347.8	15.1	−6	−23	4.3	5.3	1,448.8	56.8	−3	−16	3.9	4.5
Total 13 largest firms[e,f]	**$12,287.2**	**$322.6**	**3%**	**−27%**	**2.6%**	**3.7%**	**$47,864.1**	**$1909.0**	**0%**	**−24%**	**4.0%**	**5.2%**
Smaller 13 firms[e]	**$ 2,128.7**	**$120.9**	**0%**	**−23%**	**5.7%**	**7.4%**	**$ 8,630.3**	**$ 525.1**	**−2%**	**−14%**	**6.1%**	**7.0%**
GRAND TOTAL[f]	**$14,415.9**	**$443.6**	**2%**	**−26%**	**3.1%**	**4.3%**	**$56,494.5**	**$2434.1**	**0%**	**−22%**	**4.3%**	**5.5%**

a Excludes significant extraordinary and nonrecurring items. b After-tax incomes as a percentage of sales. c One of 15 largest firms. d Includes substantial nonrecurring charge. e For those firms reporting. f Excludes Dow Chemical results because of large nonrecurring item. **na** = not available at press time. **def** = deficit.

Ground rules for C&EN earnings analysis

C&EN's quarterly report on financial performance of the U.S. chemical industry contains data from the 30 largest U.S. basic chemical companies and from 36 oil and diversified companies, each with more than $200 million in annual chemical sales.

To be included in the table of basic chemical producers, a company must have at least 40% of its sales in chemicals, and its chemical operations must be the largest single portion of the company operations. That is why Du Pont, for example, is not included as a basic chemical producer but rather as a diversified manufacturer.

In referring to chemical sales, C&EN means sales of those chemicals whose molecular composition has been changed in the course of manufacture. Hence, chemical sales include those of traditional categories of basic petrochemicals and inorganics, organic intermediates and inorganic compounds, polymers such as plastics and fibers, agricultural chemicals, and specialty derivatives.

In listing earnings, the survey gives after-tax income for continuing operations before nonrecurring items and extraordinary charges. Foreign currency translations are included.

cluded, earnings for 30 of the largest chemical companies surveyed by C&EN would have been almost wiped out. And this does not include a huge pretax charge of $592 million at Dow Chemical. Dow would not break out an after-tax figure for its charge, thus cannot be included.

Other problems, however, remained the same in the fourth quarter as they had been in the previous four quarters or longer. The agricultural economy continued to lag and many purchases of agricultural chemicals, especially fertilizers, were delayed into the first quarter of this year as farm suppliers expected lower prices with the fall in natural gas

prices. In addition, with the ailing farm economy and some crop setaside programs, suppliers have been reluctant to build up inventories in anticipation of somewhat shaky demand forecasts.

Other problems also continue for chemical producers. These include foreign trade competition brought on in part by the strong dollar against foreign currencies and a weak chemical pricing structure, especially for petrochemicals. Expectations are for the foreign trade picture to brighten as the dollar's value falls against other currencies. However, with oil prices falling and putting pressure on petrochemicals, it is still anybody's guess how likely any firming might be. Sources say the most that can be hoped for is lower feedstock costs for chemical producers. Thus, if margins are to increase, it probably will be from the supply rather than from the demand side.

As a result, combined earnings for the fourth quarter for 26 of the 30 companies normally surveyed by C&EN fell 26% from fourth-quarter 1984 to a total of nearly $444 million. Chesebrough-Pond's, Essex Chemical, and Lubrizol had not reported fourth-quarter results by press time. And Dow has been left out of the averages because, with the inability to eliminate its huge nonrecurring charge, it would skew the averages far too much. Combined sales for the group were up 2% to a total of $14.4 billion. As a result, profit margins (after-tax earnings as a percentage of sales) fell to an average of 3.1% from 4.3% in the fourth quarter of 1984.

The smaller companies did not fare quite so poorly as the larger ones. For the 13 smaller firms reporting, cumulative earnings in the fourth quarter decreased 23% from a year earlier to about $121 million. Sales, however, remained the same at $2.13 billion. Profit margins for this group thus averaged 5.7%, down from 7.4% in fourth-quarter 1984.

For the 13 larger chemical companies, combined earnings declined 27% to about $323 million, and composite sales increased 3% to $12.3 billion. Profit margins for the group were extremely low, however, averaging 2.6% in 1985's fourth quarter, compared with 3.7% in 1984's fourth quarter.

For full-year 1985, total earnings for the 26 firms decreased 22% from 1984 to $2.43 billion, and composite sales remained the same at $56.5 billion. Profit margins fell to an average 4.3% from 5.5% in 1984. For the 13 larger companies, combined earnings fell 24% from 1984 to $1.91 billion, and combined sales remained unchanged at $47.9 billion. Thus profit margins dropped to 4.0% last year from 5.2% in 1984. For the smaller 13 firms, 1985 composite earnings fell 14% to $525 million, and total sales declined 2% to $8.63 billion. That gave an average profit margin of 6.1% for these firms in 1985, down from 7.0% in 1984.

Looked at another way, for the last quarter of 1985, 13 of the firms posted declines in earnings and three, excluding Dow, for which it is impossible to tell, reported deficits. That's some improvement from the third quarter, when 19 of the companies posted earnings drops and two showed losses, giving some

Petrochemicals profits improve in fourth quarter

Chemical results from large oil firms may offer some hope for the chemical industry in general. These earnings, coming largely from long-suffering commodity petrochemicals, show that there finally may be some pickup where a lot is needed.

In some ways, petrochemicals magnify the problems of the chemical industry. They have been plagued by extremely weak prices; increased foreign competition from newly started up plants in the Mideast, Canada, and other parts of the world and from imported finished goods such as plastics and textiles; and have been suffering through a spate of overcapacity that is still leading to plant shutdowns.

However, the fourth quarter looks better than any past quarter for some time. Chemical net earnings at five oil firms finally started to move up. Net earnings for the five totaled $162 million, up an average of 25% from the year before. This increase came from three of the five companies. Amoco's earnings were up 7%; Shell's rocketed 106%; and Mobil's climbed from a deficit of $23 million in fourth-quarter 1984 to a profit of $19 million in fourth-quarter 1985.

Exxon posted a 19% decline to $67 million, and Texaco posted a $2 million loss, compared to profits of $12 million in fourth-quarter 1984. Exxon says it had higher sales volumes, but they did not fully offset higher costs and lower margins.

For Amoco, however, higher sales volumes for most chemical and polymer products more than offset lower product margins. In addition, according to the company, results for synthetic fabrics and fibers and other plastics products generally continued a strong performance begun earlier in the year.

The improvement in the fourth quarter, however, was nowhere near enough to save full-year results. For all of 1985, total chemical net earnings for the five companies declined 29% from 1984 to $593 million, as all of the firms experienced drops with the exception of Mobil, whose chemical earnings rose 59% to $54 million.

At Shell, whose earnings fell 27%, chairman John F. Bookout says, "The earnings decline for the full year was due primarily to severely depressed margins in base chemicals—particularly olefins."

EARNINGS ON CHEMICAL OPERATIONS

	Fourth quarter			Full year		
$ Millions	1985	1984	% change	1985	1984	% change
Amoco	$ 45	$ 42	7%	$195	$211	−8%
Exxon	67	83	−19	243	430	−43
Mobil	19	−23	def	54	34	59
Shell	33	16	106	96	132	−27
Texaco	−2	12	def	5	25	−80
TOTAL	**$162**	**$130**	**25%**	**$593**	**$832**	**−29%**

def = deficit.

Earnings declined for most oil and gas and diversified firms

	% chemical sales	FOURTH-QUARTER 1985 Sales ($ millions)	Earnings[a]	Change from 1984 Sales	Earnings	Profit margin[b] 1985	1984	FULL-YEAR 1985 Sales ($ millions)	Earnings[a]	Change from 1984 Sales	Earnings	Profit margin[b] 1985	1984
OIL AND GAS COMPANIES													
American Petrofina	15%	$ 657.7	$ −39.4	24%	def	def	3.2%	$ 2,421.6	$ 13.0	13%	−71%	0.5%	2.1%
Amoco	10	7,372.0	390.0	6	−16%	5.3%	6.7	28,850.0	1953.0	−1	−11	6.8	7.5
Chevron	4	10,700.0	380.0	−20	−12	3.6	3.3	45,300.0	1445.0	−4	−6	3.2	3.2
Diamond Shamrock	21	1,063.4	47.8	−2	−16	4.5	5.3	4,101.8	205.6	−9	−15	5.0	5.4
Exxon	7	24,557.0	1488.0	0	−19	6.1	7.4	97,288.0	5403.0	4	−3	5.6	6.0
HNG/Internorth	5	3,240.1	53.3	8	−29	1.6	2.5	10,252.8	218.5	40	−24	2.1	3.9
Kerr-McGee	13	899.5	27.6	0	−48	3.1	5.9	3,344.5	136.5	−5	−11	4.1	4.3
Mobil	4	16,337.0	425.0	1	71	2.6	1.5	60,378.0	1548.0	0	22	2.6	2.1
Occidental Petroleum	7	3,775.9	33.7	−6	−82	0.9	4.6	14,534.4	455.0	−7	−20	3.1	3.6
Shell Oil	16	5,786.0	652.0	6	12	11.3	10.6	21,560.0	1650.0	−1	−7	7.7	8.1
Standard Oil (Ohio)	5	3,688.0	379.0	15	11	10.3	10.6	13,818.0	1460.0	13	−5	10.6	12.6
Sun Co.	3	4,400.0	136.0	15	0	3.1	3.6	15,080.0	524.0	−2	−3	3.5	3.5
Texaco	2	12,500.0	307.0	4	44	2.5	1.8	47,500.0	1233.0	−1	15	2.6	2.2
Unocal (Union Oil)	10	2,920.0	17.3	−2	−89	0.6	5.2	11,640.0	532.0	1	−24	4.6	6.1
Williams Cos.	22	816.0	10.7	−6	6	1.3	1.2	3,139.6	31.6	−7	−77	1.0	4.1
DIVERSIFIED MANUFACTURERS													
Allied	24	2,615.0	69.0	14	−30	2.6	4.3	9,115.0	443.0	−4	−9	4.9	5.2
Aluminum Co. of America	4	1,226.3	23.7	−12	30	1.9	1.3	5,206.5	140.3	−10	−51	2.7	5.0
Borden	28	1,250.0	55.7	9	21	4.5	4.0	4,720.0	193.8	3	6	4.1	4.0
Borg-Warner	21	1,027.9	62.7	4	11	6.1	5.8	3,963.6	178.5	1	−13	4.5	5.3
Du Pont	38	7,620.0	377.0	2	23	4.9	4.1	29,483.0	1337.0	−4	−7	4.5	4.7
Engelhard	23	675.3	11.1	5	−37	1.6	2.8	2,263.7	58.9	−10	−43	2.6	4.1
FMC	39	856.0	39.1	1	−21	4.6	5.8	3,260.9	196.6	46	−13	6.0	10.1
GAF	56	174.2	12.2	5	26	7.0	5.8	732.0	54.3	0	32	7.4	5.6
General Electric	7	8,730.0	660.0	9	1	7.6	8.2	28,290.0	2336.0	1	2	8.3	8.2
Georgia-Pacific	10	1,590.0	33.0	−10	−48	2.1	3.6	6,716.0	207.0	1	−18	3.1	3.8
Kaiser Aluminum	18	512.5	11.4	−2	192	2.2	0.7	2,028.6	−54.0	−7	def	def	def
Koppers	0	360.9	−34.5	−5	def	def	1.0	1,400.2	−30.0	1	def	def	1.7
Eli Lilly	23	817.1	124.5	5	6	15.2	15.1	3,270.6	517.6	5	6	15.8	15.8
3M	15	1,963.0	148.0	4	−11	7.5	8.9	7,846.0	664.0	2	−9	8.5	9.5
Merck	17	958.0	134.4	0	16	14.0	12.0	3,547.5	539.9	0	10	15.2	13.8
NL Industries	37	377.1	7.6	6	13	2.0	1.9	1,423.0	23.9	5	32	1.7	1.3
Pfizer	10	1,057.9	139.3	9	7	13.2	13.4	4,042.5	579.7	4	13	14.3	13.2
Tyler	33	218.9	0.7	−1	−90	0.3	3.0	912.4	15.4	−2	−47	1.7	3.1
Upjohn	13	514.0	50.3	14	15	9.8	9.7	2,008.5	203.2	6	7	10.1	10.0
U.S. Steel	6	4,700.0	57.0	0	97	1.2	0.6	19,300.0	409.0	1	−17	2.1	2.6
Vulcan Materials	33	239.0	14.3	−5	−22	6.0	7.3	971.8	79.6	0	2	8.2	8.1

a Earnings from continuing operations excluding significant extraordinary and nonrecurring items. b After-tax earnings as a percentage of sales. **def** = deficit.

hope perhaps of the beginnings of a turnaround.

Most chemical executives, in reporting earnings, chose to speak of the full-year 1985 rather than just the fourth quarter. One exception was C. Robert Powell, chairman of Reichhold Chemicals, which posted a loss in the quarter. Powell says, "We are disappointed by our 1985 fourth-quarter performance. Gross profit was off slightly owing to soft demand resulting in higher manufacturing expenses and higher raw material-to-selling price ratios in portions of our domestic businesses. These two factors were only partially offset by the gross profit contributions of our acquired businesses. The gross profit decline, coupled with higher operating expenses companywide, primarily in the acquired businesses, resulted in a fourth-quarter operating loss."

At National Distillers & Chemical, which reported a slight earnings improvement in the fourth quarter, chairman Drummond C. Bell says of the three-month period, "Petrochemical results were disappointing, improving only slightly over the depressed 1984 quarter. However, oleochemical earnings continued to increase steadily."

Dow president and chief executive officer Paul F. Oreffice says that the company "saw stronger sales volume in the fourth quarter and

price increases announced near year's end have held on most products. I am optimistic that this is an early indicator of an improved pricing climate in the months ahead."

However, the strong dollar came in for its share of the blame. American Cyanamid chairman George J. Sella Jr. states that the company's earnings decline came from the strong dollar, which affected international operations and resulted in lower prices for fertilizers and chemicals in the U.S.

Monsanto's chairman and chief executive officer Richard J. Mahoney comments: "Our chemicals, plastics, and fibers businesses suffered from a strong dollar in 1985. In spite of a reduction in the dollar's value during much of the year, import competition experienced by our customer industries as well as ourselves, limited volume demand and kept significant restraints on pricing flexibility and profit margins." But he continues, "We expect some benefits from a weaker dollar and reduced interest rates to materialize by mid-year 1986. Additionally, the benefits of our massive corporate restructuring during 1985 should improve the outlook for the chemicals, plastics, and fibers businesses in 1986 and beyond."

This optimistic attitude was quite common in the industry at the end of the fourth quarter, and at least some of the optimism was pinned on restructuring programs that took place last year. Dow's Oreffice says of that company's restructuring, especially in basic chemicals and plastics, "We expect significant near-term profit improvement in these businesses. Dow today is more trim and efficient and is well poised to maximize growth in the years ahead."

For Du Pont, chairman Edward G. Jefferson says, "Results for 1985 reflected weaker demand for chemical and specialty products, lower prices in many businesses, and continued global competitiveness problems resulting from the abnormal strength of the U.S. dollar. In the past year we took additional steps to improve our competitive position through further productivity improvements, business restructurings, stronger marketing efforts, and introduction of new products." He adds, "We enter 1986 in a stronger competitive position. Du Pont's cash flow from operations remains excellent, and major restructuring efforts are behind us. We have strong expectations for many new products under development and for investments we have made in attractive markets." □

Biotechnology firms still difficult to evaluate

David Webber, C&EN New York

As the biotechnology-based industry moves steadily closer to a truly commercial phase, it is rapidly assuming a clearer and clearer profile. A burgeoning of product developments and business arrangements is imparting depth and color to what was, just a few years ago, little more distinct than a connect-the-dots picture.

But representatives of small biotechnology companies, large chemical and pharmaceutical corporations, and the investment community who met earlier this month at the Industrial Biotechnology Association's annual biotechnology financial issues meeting in Fort Lauderdale agree that there is still a long way to go before it is possible to sketch in the ultimate shape of biotechnology-based commercial activity. And the investment analysts, who must attempt to place a value on the individual players in the biotechnology field, agree that they are still a way from a fully satisfactory method with which to differentiate the promise of the small firms. Those issues and others were discussed in talks ranging from biotechnology finances to strategic planning to merger and acquisition possibilities to the international scene.

The investment community's perspective on the small biotechnology companies will cycle between concern over possible pitfalls and belief in their promise over the next half year, says Linda J. Miller, assistant vice president at Paine Webber. During the second half of the year, she says, investors will begin to base their decisions more on actual payoffs in the form of new product introductions, good results from clinical tests, better financial statements, and continued evidence of corporate interest in biotechnology acquisitions.

She and other analysts agree that the key events fueling the rise in biotechnology stock prices that has surged unchecked since last September were two acquisition agreements made in third-quarter 1985—Eli Lilly/Hybritech and Bristol-Myers/Genetic Systems—along with the Food & Drug Administration's approval of Genentech's human growth hormone, a general improvement of financial performance across the industry, and a more positive patent picture.

According to Miller, the acquisitions were the triggering event: They made biotechnology's commercial promise credible again by showing that there was a "safety net" of technology value to an investment, whether a company managed to develop a line of major products or not. The growth hormone approval, she argues, "catapulted other products into the same favorable framework."

In the patent area, she points out, broad blocking patents, which could slow the general movement to commercialization, lost some of their teeth. Hybritech's failure to prove patent infringement against Monoclonal Antibodies was taken as a case in point (C&EN, Sept. 9, 1985, page 6). At the same time, she notes, product-related patents, essential to the security of the small companies, gained ground.

However ascendant the theme of promise has been since last fall, Miller believes investors will be increasingly concerned with payoff as the year wears on. For one thing, the stock market's current cumulative valuation of the biotechnology companies, now in the $4 billion to $5 billion range, can be supported only by an accelerating number of tangible positive developments, she contends.

In addition, she expects that the increase in investment opportunities in the biotechnology area will force investors to be more selective.

he says, many of the issues that preoccupy the small biotechnology firms—finances, general management, regulatory staffs, and the like—do not matter to the large company. "They will ask themselves one simple question," Fildes says: "What is this company's scientific capability?"

Potential acquirers also will base their decision on a small firm's product line, he says. Some will look for products that fit and can extend their current business areas, as Bristol-Myers did in acquiring Genetic Systems. The aim there, many agree, was to bolster Bristol's existing business in anticancer products. Others will buy to diversify into new areas. One example is the Hybritech acquisition, which gave Lilly entry into the diagnostics arena.

The small biotechnology companies must consider the possibility of being acquired from a different perspective, Fildes notes. "How can companies resist?" he asks. "Or, when should they?"

"If your object is to increase the return to your shareholders, you must ask the question of whether you should resist at all," he says. "I don't think you can resist too easily anyway. If somebody is determined to get you, there are ways to do it."

On the other hand, he says, large corporations realize that an unfriendly acquisition would not work, because the "powerhouse" of the small companies is their employees. Current wisdom holds that most of them would either not wish to work for a large corporation or would wither outside the more free-wheeling climate of the small, entrepreneurial companies. "If you can't keep the people," Fildes says, "you've bought nothing." □

Drug firms dominate biotechnology patents

Although the small biotechnology companies that started up during the past decade still gain most of the publicity, it is the large, established pharmaceutical companies that continue to dominate biotechnology-related patent activity in the U.S., according to Omec International, a Washington, D.C., consulting firm. Omec's analysis of patents issued in 1985 in the biotechnology field also show U.S. corporations broadening their share of the patent picture at the expense of foreign concerns. U.S. universities, too, are gaining an increasing number of patents.

According to Omec, the U.S. Patent & Trademark Office issued a total of 1078 biotechnology-related patents in 1985, compared with 1114 in 1984 and 1018 in 1983. U.S. companies, universities, organizations, or individuals accounted for 640 of them, compared with 663 in 1984 and 562 the year before that. Of the U.S. total, 489 patents went to corporations, well up from 441 a year earlier and 400 in 1983. U.S. universities were awarded 86 of the patents, up from 1983's 68 but below the 95 in 1984. However, Omec points out, the 1985 calculation does not include patents issued to nonprofit organizations on behalf of universities. Adding those would bring the 1985 academic total to 98. The remaining portion of the U.S. total, 65, was accounted for by nonprofit groups, government agencies, and individuals. That figure has fluctuated: 127 in 1984 and 94 in 1983.

Although down from an impressive 45% of all U.S. biotechnology-related patents in 1983, the share of such patents awarded to foreign entities remained a significant 41% last year. Foreign corporations dominated the segment, winning 363 U.S. patents in 1985, compared with 371 in 1984 and 383 in 1983. Foreign universities, nonprofit organizations, government agencies, and individuals received 75 patents last year, compared with 80 the year before and 73 in 1983.

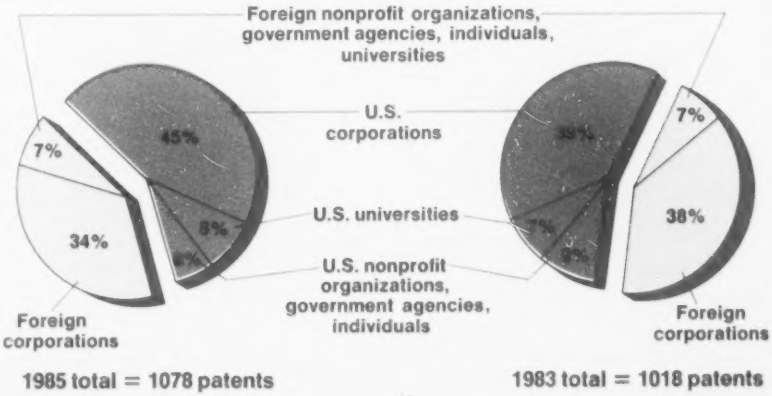
The largest number of patents went to major pharmaceutical houses. Eli Lilly led all firms with 28 last year, followed by Miles Laboratories with 19, Boehringer Mannheim with 14, Merck with 13, and Pfizer with 12. Of 32 firms receiving five or more biotechnology-related patents in 1985, only four were small biotechnology operations.

Japan continued to dominate foreign patent activity in 1985. Of the 438 U.S. biotechnology-related patents issued to foreign entities last year, 178, or 41%, went to Japan. The next closest country was West Germany with 73 patents, or 17% of the foreign total. Other countries with more than 10 patents were France with 33, the U.K. 32, Canada 20, U.S.S.R. and Soviet-bloc nations 15, the Netherlands 14, Italy 11, Sweden 11, and Switzerland 11.

The most prominent universities in the area last year were the University of California system with 14, the University of Minnesota six, Stanford six, and Cornell, MIT, and Purdue four each.

David Webber, New York

American corporations gain larger share of biotechnology-related patents issued in U.S.



Source: Omec International

Profits of Canadian Chemical Firms Surge in Fourth Quarter

However, 1985 as a whole was a tough year for four large companies, whose combined sales rose only 1.3% over 1984 and profits dropped 21%

Like a long-distance runner with a strong finishing sprint, the Canadian chemical industry ended 1985 with vastly improved sales and profits in the fourth quarter. But that still wasn't enough to make 1985 a year the industry would want to relive.

Canada's national energy program, which raised feedstock costs for Canadian chemical companies, is gone—replaced by more-market-oriented energy pricing policies. But the industry still had to bear the brunt of NEP during most of 1985. Meanwhile, for many chemical products, intense competition and overcapacity in the industry's all-important international markets made 1985 a tough year.

The combined results of four large publicly traded Canadian chemical companies tell the story. In fourth-quarter 1985, those firms (C-I-L, Celanese Canada, Du Pont Canada, and Union Carbide Canada) boosted sales 8.8% (based on Canadian currency) from fourth-quarter 1984 to $638 million ($1.00 = 1.40 Canadian dollars at the end of December 1985). Profits, however, rose a hefty 60% to $17.2 million, and profit margins (net income as a percentage of sales) improved to 2.7% from 1.8% in fourth-quarter 1984.

But one quarter does not make a full year. For all of 1985, the combined results of the four companies show sales inching up only 1.3% from 1984 to $2.48 billion and profits dropping a worrisome 21% to $51.7 million. Profit margins, naturally, felt the impact, dropping to 2.1% from 2.7% in 1984.

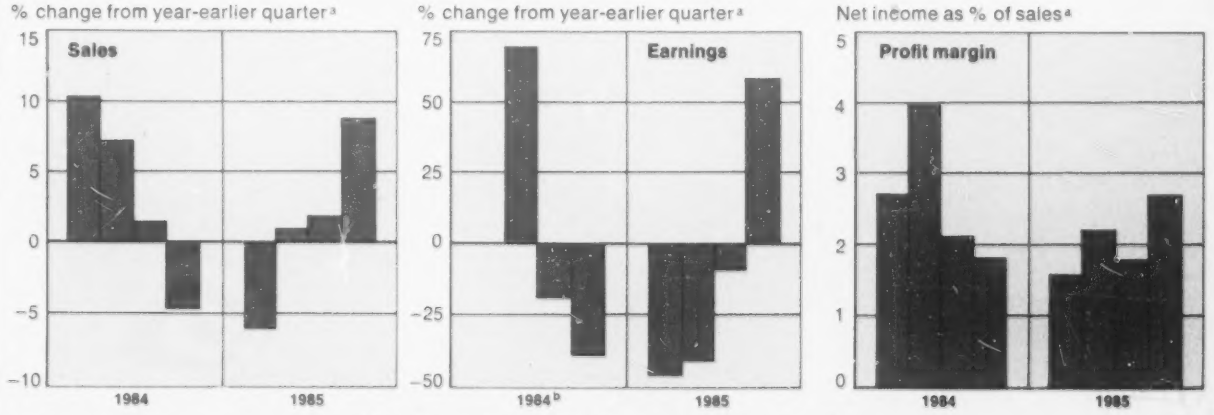
Admittedly, the four companies have different product lines and different business philosophies. No one of them can be said to represent a less-than-homogeneous chemical industry. Nevertheless, based on financial results available from a scattering of other Canadian firms with chemical operations, the combined results of the Big Four, with their good fourth quarter and poor full year, reflect fairly accurately the kind of year that 1985 was for the entire Canadian chemical industry.

Of the Big Four chemical companies, only Celanese Canada had an exceptionally profitable year. Although full-year sales were down 4.1% in 1985 to $265 million, profits were up a staggering 61% to $9.0 million, with most of the gain coming in the third and fourth quarters.

In the fourth quarter, for instance, Celanese Canada's net income rose 373%, following a 375% gain in the third quarter—even though fourth-quarter sales increased only 0.8% over fourth-quarter 1984.

Robert J. St. Jacques, executive vice president of Celanese Canada, says that quarterly earnings in the fourth quarter were the company's best since the second quarter of 1981.

Chemical industry sales, earnings, and profit margins are on the rebound



a Based on combined Canadian-currency results of C-I-L, Celanese Canada, Du Pont Canada, and Union Carbide Canada.
b No first-quarter point because of deficit in first-quarter 1983.

He credits the firm's three-year restructuring and reorganization program for much of the improvement. Improved exchange rates for European currencies against the Canadian dollar also helped.

Last year the remaining Big Four companies fared far less well than Celanese Canada. Union Carbide Canada, for instance, saw its net income before extraordinary items plunge 97% despite a 283% jump in the fourth quarter. For the entire year, Carbide Canada essentially broke even on operations, earning $100,000 despite a 5.8% drop in sales to $465 million. But an extraordinary charge related to the company's planned sale of its polyethylene business saddled it with a net loss of $64 million for the year. The firm has included polyethylene sales in its 1985 results for comparison purposes, but this business will be reclassified as "discontinued operations" in its 1985 annual report.

Carbide Canada chairman W. Norman Kissick says the company's plastics, chemicals, gases, and carbon businesses improved in the fourth quarter. Meanwhile, heavily discounted "gray-market" imports from Europe have put price pressure on the firm's battery operations.

Carbide Canada's consumer product businesses will be sold early this year—part of Union Carbide Corp.'s decision to divest its worldwide consumer operations. Although that will lower Carbide Canada's sales, Kissick expects earnings to improve appreciably.

Du Pont Canada also followed the good-fourth-quarter, poor-year pattern. Fourth-quarter earnings from operations increased 37% for Du Pont, whereas yearly earnings of $14.7 million were down 50% on 1.3% higher sales of $847 million. But Du Pont shed its investment in Petrosar Ltd. and closed a lead alkyl plant last year. Those extraordinary charges gave the company a net loss of $18.5 million in 1985.

C-I-L was the one company among the Big Four whose fourth-quarter income dropped last year despite a 15% sales gain. For the year, C-I-L's sales advanced 7.5% to $902 million, but net income from operations increased only 2.6% to $27.9 million. The company also had to shoulder a $15 million extraordinary charge by closing its phosphoric acid and phosphate fertilizer facilities at Courtright, Ont.

The diversified C-I-L increased sales volume for many products, especially ammonia from its expanded Courtright plant. However, intense competition and overcapacity continued to plague prices for fertilizer and explosives. The company hopes that a new agreement, under which it will obtain lower-cost feedstock for its Courtright ammonia unit, will improve its competitive position in North American nitrogen products markets.

Earl Anderson, New York

For Canadian firms, a strong fourth quarter but poor year

$ Millions[a]	Net sales	Change from 1984[b]	Net income	Change from 1984[b]	Profit margin[c] 1985	Profit margin[c] 1984
FOURTH-QUARTER 1985						
C-I-L	$224.9	15.0%	$ 3.6	−29.9%	1.6%	2.6%
Celanese Canada	74.3	0.8	3.7	372.7	5.0	1.1
Du Pont Canada	213.1	5.4	5.0	37.3	2.4	1.8
Union Carbide Canada	126.0	9.3	4.9	283.3	3.9	1.1
TOTAL	**$638.3**	**8.8%**	**$17.2**	**59.6%**	**2.7%**	**1.8%**
FULL-YEAR 1985						
C-I-L	$ 902.5	7.5%	$27.9	2.6%	3.1%	3.2%
Celanese Canada	265.4	−4.1	9.0	61.5	3.4	2.0
Du Pont Canada	847.0	1.3	14.7	−50.0	1.7	3.5
Union Carbide Canada	464.8	−5.8	0.1	−96.5	neg	0.8
TOTAL	**$2479.7**	**1.3%**	**$51.7**	**−21.3%**	**2.1%**	**2.7%**

a $1.00 = 1.40 Canadian dollars. b Based on Canadian currency. c Net income as percentage of sales. neg = negligible.

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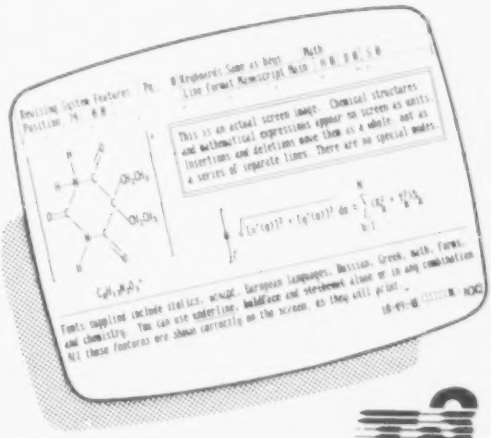

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corporate. "There's real potential," reports Sheldon Krimsky of the Tufts University department of urban and environmental studies, "of the Strategic Defense Initiative tearing the campuses apart. Lines are being drawn. Friendships are being tested. There are clauses in some contracts I know about that say that if classified results do come out, the researcher must continue to do the research under classified status. For the first time since the 1950s, faculty meetings at which corporate and defense research funding are discussed are closed to nonparticipating members of the university community. It isn't that mass concern is sweeping academia—indeed, if any reaction is prevalent, it is that of euphoria over the government's intention to fund interdisciplinary research centers at the major research universities."

However, there are local concerns. Studies he did for the Office of Technology Assessment, Krimsky says, reveal that the people living near academic communities are showing less confidence that the government is protecting them from classified research being done in university laboratories. "We see local communities frustrated by what they see as potential risks that are not handled by the scientific community, like the Monterey, Calif., board of supervisors saying no to the release of organisms in the environment. There is no confidence that the federal government is interested in really protecting the public."

So the academy meeting, most of it closed to the press, will provide a lot to talk and haggle over. The scientific establishment prizes objectivity and is beginning to show some skepticism over the rosy picture the "new science policy" represents, such as the phenomenon of the Office of Science & Technology Policy calling the Engineering Research Centers hugely successful before any have begun functioning.

A survey of the new relationships by social scientists Dorothy Nelkin of Cornell University and Richard Nelson of Yale sets the new cautionary tone. The assessment was done for the Academy Government-University-Industry-Research Roundtable. "We are of two minds regarding the meaning of this rosy picture," they say. "On the one hand, it is comforting. On the other, we talked only to people who are benefiting from these agreements. We found it difficult to get beneath the promotional tone of the involved corporate and university scientists to find out what was really going on.

"To th · extent that these new relationships are experiments," Nelkin and Nelson conclude, "they may be experiments that strongly resist negative evaluation."

How the academy meeting evaluates the situation, then, should make interesting theater. Krimsky, Nelkin, and other social scientists engaged in research on the policy issues the academy will be dealing with report that their field, too, is being starved out of existence by federal cuts. □

Budgets for regulatory agencies gain little

For some years big budget increases haven't been in the cards for the federal regulatory agencies that in one way or another affect the chemical industry. And with the Administration intent on meeting the fiscal 1987 mandatory deficit target of $144 billion set in the Balanced Budget & Emergency Deficit Control Act of 1985, fiscal 1987 will be no exception.

In the Administration's fiscal 1987 budget proposal, a number of the agencies, such as the Environmental Protection Agency, Occupational Safety & Health Administration, and Food & Drug Administration, are slated for funding increases above fiscal 1986 levels. But for some agencies there is an increase only because fiscal 1986 funding levels were reduced 4.3% from Congressionally set levels by the automatic cuts mandated by the balanced budget act.

EPA's fiscal 1987 regulatory budget is slated to rise 8% to $2.2 billion. Most of that increase is accounted for by a 22% rise to $1.0 billion in funding for the Superfund hazardous waste site cleanup program. (That request is based on the Administration's proposed $5 billion, five-year reauthorization of the program. The actual amount is likely to be much higher if the House and Senate finally agree on how to finance the expanded Superfund program they both advocate.)

Also increased at EPA are programs aimed at curbing future hazardous waste problems, up 10% to $206 million, and ensuring the health and environmental safety of pesticides, up 2% to $56 million. In the pesticide safety area, EPA will allocate some $22 million for the generic chemical review program.

The toxic substances program, on the other hand, is on a steep downward slide, falling 45% to $57 million. A large portion of the decrease, $44 million, reflects EPA's decision not to request financial assistance for state and local asbestos abatement programs. However, EPA has requested a 65% increase, to about $7 million, for its radon assessment and monitoring program.

At OSHA, funding is slated to

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EPA's regulatory budget would rise 8%

$ Millions	1987[a]	1986[a]	1985[b]	% change 1986–87
Superfund	$1050.0	$ 861.3	$ 620.0	22%
Management and support	291.3	271.0	294.5	7
Water quality	193.4	217.8	228.4	−11
Air	176.0	180.0	168.2	−2
Hazardous waste	205.6	186.1	145.3	10
Drinking water	61.6	63.1	67.2	−2
Toxic substances	56.9	102.3	59.5	−44
Pesticides	56.2	55.0	57.2	2
Interdisciplinary	28.5	29.2	29.7	−2
Radiation	59.4	59.6	11.1	—
TOTAL	$2178.9	$2025.4	$1681.1	8%

a Estimate. b Actual. **Note:** Obligations. **Source:** Environmental Protection Agency

. . . OSHA's just 4% . . .

$ Millions	1987[a]	1986[a]	1985[b]	% change 1986–87
Enforcement	$145.1	$139.7	$139.4	4%
Federal	90.2	86.7	86.4	4
State	54.9	53.0	53.0	4
Compliance assistance	36.0	35.2	36.2	2
Safety and health statistics	18.6	18.0	21.0	3
Technical support	14.7	13.5	12.3	9
Safety and health standards	6.0	5.8	5.5	3
Administration	5.4	5.3	5.1	2
TOTAL	$225.8	$217.5	$219.5	4%

a Estimate. b Actual. **Note:** Obligations. **Source:** Office of Management & Budget

. . . and FDA's a scant 1%

$ Millions	1987[a]	1986[a]	1985[b]	% change 1986–87
Drugs	$154.4	$159.3	$154.4	−3%
Foods	117.8	114.7	110.5	3
Devices and radiological products	69.4	68.5	67.3	1
Program management	57.8	55.3	58.6	4
National Center for Toxicological Research	22.7	22.3	22.1	2
Facilities	1.4	—	—	—
TOTAL	$423.5	$420.1	$412.9	1%

a Estimate. b Actual. **Note:** Obligations. **Source:** Office of Management & Budget

increase just 4% from fiscal 1986 to $226 million, the same level it would have been in fiscal 1986 without the automatic budget cut. OSHA says it will issue five health standards in fiscal 1987, up from four this year; increase its number of inspections from 65,000 to 71,400; and decrease its number of consultation visits from 31,650 to 30,600.

FDA's proposed budget is up just 1% to $423 million, and personnel, expected to be down 300 this year, will be down another 200 in fiscal 1987. The Consumer Product Safety Commission's efforts to protect the public from hazardous products will proceed with 8% less funding at $33.4 million.

In the legal area, funding for the Justice Department's environmental enforcement activities would rise 2% to slightly more than $23 million, and funding for the antitrust division is slated to increase 4% to $46 million. Funding for the Federal Trade Commission would be held essentially constant at $69 million. On the opposite end of the scale, government support for the Patent & Trademark Office would rise almost 30% to $111 million. However, processing fees collected by PTO are expected to be down 7% in fiscal 1987 to $142 million, so its total budget would be up only 6% to $244 million.

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